

43. *Agrion pulchellum*, Van der Lind.  
*A. puella*, Steph. ; Evans, pl. 3. f. 7, 8 (not good).  
*A. lunulatum*, Evans, pl. 4. f. 3, 4 (exclus. syn.).  
*A. hastulatum*, Evans, pl. 4. f. 5, 6, not good (exclus. synonym.).  
*A. cyathigerum*, Evans, pl. 4. f. 7, 8 (exclus. synonym.).  
*A. rufescens*, Evans (partim), pl. 5. f. 2, not good (excl. syn.).  
*A. interruptum*, Charp.  
 England. General.—Mus. Steph., Evans, Dale, &c.  
 Scotland. Mus. Blyth.  
 Ireland. Mus. Hyndman, Haliday. Belfast, De Selys.
44. *A. puella*, L. (pars), Van der Lind.  
*A. furcatum*, Charp., Curt. ; Steph. Ill. ; Evans, pl. 4. f. 1, 2.  
*A. annulare*, Steph. Ill. (female) ; Evans, pl. 5. f. 1 (not good) (exclus. syn.).  
*A. rufescens*, Leach (partim : young male), Curtis.  
 England. Local, London.—Mus. Steph., Evans, Curtis, Dale.  
 Scotland. Mus. Greville, Blyth.  
 Ireland. Mus. Miss Ball, Hyndman, Haliday.
45. *A. mercuriale*, Charp.  
 (Not described by English authors.)  
 England. In the south.—Mus. Dale, Curtis.
46. *A. cyathigerum*, Charp.  
*A. annulare*, Leach, Steph. Catal. (without any description).  
*A. hastulatum*, Steph. Nomencl. and Ill. (exclus. syn.).  
*A. brunnea*, Evans, pl. 4. f. 8 (junior).  
*A. zonatum* (partim), Steph. Ill.  
*A. Charpentieri*, De Selys, 1840.  
 England. Local.—Mus. Steph., Dale, Curt., Evans, &c.  
 Scotland, Mus. Greville. Oban, De Selys.  
 Ireland. Mus. Miss Ball, Haliday. Belfast, De Selys.  
 To this species should probably be referred as a variety, the *Agrion scoticum*, Dale MSS., collected in Scotland.

XXV.—On the Arrangement of the Hollow-horned Ruminants  
 (Bovidae). By J. E. GRAY, F.R.S.

THE systematic arrangement of these animals has been one of the most difficult subjects for the student of mammalia.

Linnæus (Syst. Nat. i. 27), in his last edition of the 'Systema Naturæ,' divides them into three genera according to the direction of the horn, which he describes as erect in *Capra*, reclinate in *Ovis*, and porrect in *Bos*, and separates these from *Cervus* because they have tubular, while that genus has solid branched and deciduous horns.

Gmelin in his edition adds to these the genus *Antilope* which had been established by Pallas, and characterizes that

genus as having solid horns like the *Cervi*, but simple and persistent. Now I need scarcely observe that these characters will not define the genera, for all *Goats* have not erect horns, if any have, and it is the same with the other genera; and we all know that the Antelopes have tubular horns, in the sense that word is used by Linnæus, as much as the Oxen, Sheep and Goats; but this error of Gmelin has had its influence up to this time, for the horns of Antelopes in Cuvier's first and last edition of 'Le Règne Animal' are described as having "the nucleus of the horn solid, and without pores or sinuses, like the horns of the Stags."

M. Geoffroy, perceiving that the characters furnished by Linnæus were not sufficient to separate the Antelopes from the other genera, examined the structure of the prominences of the frontal bones which form the core or support of the horns of the Antelopes, and he describes the core of the horns of the Antelopes to be solid and without sinuses, while he characterizes the cores of the horns of the Goats, Sheep and Oxen as in great part occupied with cells which communicate with the frontal sinus, and Cuvier, Latreille and most authors have without re-examination adopted these characters.

Some years ago I examined the cores of the horns of many species of Antelopes for Colonel H. Smith, and found they were all more or less cellular within, and these cells had a communication with the frontal sinus; certainly the cells are not so numerous as in the thick horns of some Oxen, but they are quite as numerous for the thickness of the core; but it is to be remembered that the general character of the horns of Antelopes is to be slender and elongated, and consequently there is not so much room for cells, as their presence would destroy the strength of the core so as not to form a fit support for the horns; and thus this character is merely reduced to one dependent on the small size or slenderness of the horns, which, though usual, is not universal in the genus, for example in the *A. Oreas* and others.

Colonel Smith, aware of this difficulty, divided these animals into two families: *Capridæ*, characterized by having the horns "vaginating upon an osseous nucleus totally or nearly solid," containing the genera *Antilope*, *Capra*, *Ovis*, and a new genus which he called *Damalis* for the Antelopes with high withers; and second, the family *Bovidæ*, with horns "vaginating upon a bony nucleus not solid, but more or less porous and cellular," including the genera *Catoblepas* or *Gnu*, *Ovibos* or *Musk Ox*, and *Bos*\*.

This arrangement shows that much reliance is certainly not to

\* I may remark that Cuvier says that the genus *Bos* has a large naked muffle, yet two species which he refers to it have a hairy muzzle like the Sheep, viz. *Bos grunniens* and *B. moschatus*.

be placed on M. Geoffroy's character for the genus *Antilope*, for here the Goat and Sheep are said to have the same peculiarity as he gives to separate the Antelopes from them.

Several authors after this period considered the subgenera proposed by De Blainville and Colonel H. Smith as genera, and grouped them into families.

Mr. Ogilby, in a theoretical arrangement of Ruminants, published in the 'Proceedings of the Zoological Society' for 1836, divides these animals into two families characterized thus: *Capridæ*, "muffle none;" *Bovidæ*, "muffle distinct, naked." Of this arrangement I need only remark, that he places *Ovibos* in *Capridæ* and *Bos* in *Bovidæ*, *Kemas* or the Jemla Goat in *Bovidæ*, and *Capra* in *Capridæ*, thus separating into distinct families most nearly allied species; while the genus *Ixalus*, which is an antelope with rudimentary horns, is referred to the family *Moschidæ*, and the *Gnu* is entirely overlooked. I am satisfied, if Mr. Ogilby had attempted to arrange a collection by this system, he must have soon abandoned it.

Within the last few years Professor Sundevall of Stockholm has proposed to arrange these animals according to the form of their hoofs, and he has regarded the subgenera of preceding authors as genera, and divided them into four families thus: 1. *Caprina*, containing *Ovis*, *Capra*, *Nemorhedus* and *Oreotragus*. 2. *Antilopina*: *Antilope*, *Dicranoceras* and *Bubalus*. 3. *Bovina*: *Oryx*, *Catoblepas*, *Ovibos*, *Bos*, *Anoa*, *Portax*, *Damalis*. 4. *Sylvicaprina*: *Hippotragus*, *Strepsiceros*, *Cervicapra*, *Calotragus*, *Nanotragus*, *Neotragus*, *Sylvicapra*, *Tragelaphus* and *Tetracerus*. In this arrangement he appears to have overlooked the fact, that the hoofs of these animals are modified according to the kind of country which the animal is destined to inhabit, and therefore this arrangement is dependent on that single circumstance, and not on the considerations of all the peculiarities of the species; hence the species which inhabit rocky pinnacles, as the Thar and Ghoral (*Nemorhedus*) and Klipspringer (*Oreotragus*), are separated from the other Antelopes and placed with the Goats, and the large and heavy Antelopes which inhabit the plains, as the *Oryx*, *Portax* and *Damalis*, are placed with the Oxen.

If this system is fully carried out, the *Rein Deer* should be separated from its allies and placed with the *Musk Ox*; and I am not certain that the *Addax* antelope should not be arranged in the same group, for it has the same shaped hoofs, the sands of the Desert probably requiring the same structure for progression as the snow.

After examining all these arrangements, and after repeated examinations of the animals, I believe that the form of the horns affords the most natural character for subdividing them into



groups; and I think that if the Antelopes are divided into two groups, which appear to me natural, then there is no difficulty in finding neat characters for the definitions of the families.

I. The horns round or compressed, without any raised keel on the inner front angle.

1. The horns smoothish, spread out on the sides, cylindrical or depressed at the base, the knee (or wrist) below the middle of the fore-leg—*Boveæ*.

2. The horns conical, bent back, cylindrical or compressed, and ringed at the base, the knee (or wrist) in the middle of the fore-leg—*Antilopeæ*.

II. The horns subangular with a more or less distinct ridge on the front angle, the knee in the middle of the fore-leg.

3. The horns subspiral, erect; tear-bag distinct; forehead flat; male not bearded—*Strepsicereæ*.

4. The horns recurved, compressed; tear-bag none; forehead concave; male bearded—*Caprææ*.

5. The horns spiral, bent out on the sides; tear-bag none; forehead convex; male not bearded—*Oveæ*.

The position of the knee is the external mark of the shortness of the cannon bone, compared with the length of the *ulna* or fore-arm bone.

The *Boveæ* consist of the genera *Bos*, *Bibos*, *Bison*, *Bubalus* and *Anoa*, with a naked moist muffle, and *Poephagus* and *Ovibos* with a hairy ovine muzzle.

These genera are well distinguished by the form of the intermaxillaries. In *Poephagus* (*grunniens*), *Bibos* (*frontatus* and *Gour*), and in *Bison* (*Urus*), they are short, triangular, acute behind, and not reaching to the nasal, being gradually shorter in proportion from *Poephagus* to *Bison*. In *Bos* (*Taurus*) and *Bubalus* (*Buffelus* and *Caffer*) they are elongate, reaching to the suture between the nasal and cheek-bone, and extending furthest up in *B. Buffelus*.

The *Strepsicereæ* are peculiar for being the only hollow-horned ruminants which are marked with white streaks or spots; they consist of the genera *Portax* from India, *Strepsiceros*, *Boselaphus* and *Tragelaphus* from Africa; the three former have ovine and the last a naked moist nose.

The *Caprææ* consist of three genera, *Hemitragus* with a moist muffle, *Ibex* and *Capra* with an ovine hairy one; and *Oveæ* consists only of the genus *Ovis*. It may be remarked that the keel of the horns of these animals, and especially of the Goats, is on the inner part of the front edge of the horns; but in the Marbur or Snake-eater of Affghanistan the strongest keel which forms

the spiral ridge arises from the hinder part of the inner side of the horns, the front one being obscure.

The genera of the *Antilopeæ* being more numerous are worthy of a more minute examination, considering as I do that it is important to divide these numerous genera into natural groups, more especially as there appears to be a character afforded by the nostrils which has been hitherto overlooked, and which separates them into two very distinct and easily recognised sections. This character shows the real position of the *Gnu*, and at the same time proves that Colonel Hamilton Smith was correct in forming his genus *Damalis*, though he did not discover the character by which it was best to be defined, and hence placed with it some species that were not truly allied to it; and it leaves the other Antelopes easily reducible into small groups.

The *Antilopeæ* may be thus divided:—

I. The *Antelopes of the Fields* have the nostrils bald within.

1. The *True Antelopes* are light-bodied and slender-limbed, with small hoofs and a short or moderate tail covered with elongated hairs to the base, and lyrate or conical horns.

A. *Horns moderate, lyrate; muzzle ovine.*

SAIGA. Nose very high, compressed, truncated. Horns white, lyrate. *S. Cobus*.

KEMAS. Nose of male with a dilatation on each side. Horns elongated, compressed, sublyrate. *K. Hodgsonii*.

GAZELLA. Nose tapering, simple. Horns lyrate. Tear-bag distinct. *G. gutturosa*, *G. subgutturosa*, *G. Dorcas*, *G. rufifrons*, *G. Isabella*, *G. Bennettii*, *G. Semmeringii*, *G. Dama*, *G. ruficollis* and *G. mohr*.

ANTILOPE. Nose tapering. Horns lyrate, elongate. Tear-bag none. *A. melampus*.

CERVICAPRA. Nose tapering, simple. Horns cylindrical, subspiral. *C. bezoartica*.

B. *Horns slender, conical, small.*

NEOTRAGUS. Muffle ovine. Crown crested. Tear-bag large, round. *N. Saltiana*.

CEPHALOPHUS. Muffle bald. Crown crested. Tear-bag a linear glandular line. *C. mergens*, &c. See p. 163, &c. of this volume.

NANOTRAGUS. Muffle bald. Tear-bag none. False hoofs none. *N. pygmæa*.

TETRACERUS. Muffle bald. Horns two pairs. Tear-bag longitudinal. *T. quadricornis*.

OREOTRAGUS. Muffle bald. Horns elongate, acute. Tear-

bag transverse. Hoofs square, compressed. Hair thick, wavy.  
*O. saltatrix*.

CALOTRAGUS. Muffle bald. Horns elongate, acute. Tear-bag transverse. Hoofs triangular. Inguinal pores and knee-tufts none. *C. Tragulus* and *C. melanotis*.

SCOPOPHORUS. Muffle bald. Horns elongate, acute. Tear-bag transverse. Hoofs triangular. Knees with large tufts. Inguinal pores distinct. *S. Ourebi* and *S. montanus*.

ELEOTRAGUS. Muffle bald. Horns elongate, recurved. Tear-bag none. Hoofs triangular. Inguinal pores distinct. *E. Capreolus*, *E. arundinaceus* and *E. reduncus*.

2. The *Caprine Antelopes* are heavy-bodied and limbed and large-hoofed, with a very short depressed tail covered with hair to the base, and with conical horns, rarely with a flat process in front.

CAPRICORNIS. Muffle bald. Horns recurved, ringed at the base. Tear-bag large, round. *C. sumatrensis*, *C. bubalina* and *C. crispa*.

NEMORHEDUS. Muffle ovine. Horns recurved, ringed at the base. Tear-bag none. *N. Goral*.

MAZAMA. Muffle ovine. Horns nearly erect, ringed at the base, recurved at the tip. Fur of two sorts. *M. americana*.

RUPICAPRA. Muffle ovine. Horns slender, erect, sharply recurved at the tip. Fur soft. *R. Tragus*.

ANTILOCAPRA. Muffle ovine. Horns slender, erect, with a flat process in front and recurved at the tip. *A. americana*.

3. The *Cervine Antelopes* are large-sized, rather heavy-bodied animals, with an elongated tail with short hairs at the base and tufted at the tip. Horns elongate.

KOBUS. Muffle naked. Neck maned. Horns sublyrate, bent forwards at the tip. *K. ellipsiprymnus*, *K. Singsing* and *K. de-fassa*.

AIGOCERUS. Nose cervine. Nape with a reverse mane. Horns elongate, recurved, compressed. Tear-bag covered with hair. *A. leucophæus* and *A. niger*.

ORYX. Nose cervine. Nape with a reverse mane. Horns elongate, cylindrical, straight or slightly arched. Tear-bag none. *O. Gazella*, *O. Biessa* and *O. leucoryx*.

ADDAX. Nose ovine. Neck not maned. Horns elongate, cylindrical, subspiral. Hoofs broad in front. *A. nasomaculatus*.

II. The *Antelopes of the Desert* have a broad nose, and the nostrils are subvalvular and lined with bristles within.

4. The *Equine Antelopes* have the muffle depressed, spongy and bristly, and the nostrils valvular.

CATOBLEPAS. *C. Gnu* (var. *C. taurina*) and *C. Gorgon*.



5. The *Bovine Antelopes* have the muffle moderate, with a small naked moist muzzle under the nostrils.

BOSELAPHUS. Horns lyrate, thick at the base on the produced upper edge of the frontal bone. Tear-bag covered with a tuft of hair. *B. Bubalis* and *B. Caama*.

DAMALIS. Horns lyrate, tapering. Tear-bag naked. \* *D. lunatus*, \*\* *D. senegalensis*, *D. Koba*, *D. pygarga*, *D. albifrons*, and *D. ? Zebra*.

All these species, except *Gazella Dama* and *G. mohr*, *Scophophorus montanus*, *Capricornis sumatrensis* and *C. crista*, *Mazama americana*, *Oryx Biessa* and *Damalis albifrons*, are in the British Museum collection.

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XXVI.—*An Account of some Shells and other Invertebrate Forms found on the coast of Northumberland and of Durham.* By WILLIAM KING, Curator of the Newcastle Museum\*.

MOST of the objects treated of in this paper have been obtained at different times from the cobbles and the decked boats which frequent the fishing-grounds between the Dogger-bank and the coast stretching from the Tweed to the Tees; the remainder were got during a dredging excursion in a decked fishing-boat on some of the same grounds in the latter part of last June.

Though I was at sea from Monday till Friday, yet in consequence of the extremely unfavourable state of the weather for the greater part of the time, the dredge was not put down more than five times; it will therefore be readily presumed that my dredging operations were not so successful as could be wished.

At every haul of the dredge I was particular in noting the different kinds of objects brought up, the depth of water, and the nature of the sea-bottom.

The dredge was first put down (on Tuesday morning) in fifty fathoms water, not far from the edge of the Dogger-bank, and at about sixty miles east of Sunderland: here it brought up a large number of dead shells in a chalky state, and a few living objects: the former consisted of *Pecten opercularis* and *Mastra elliptica* in abundance, several specimens of *Mya truncata* †, two

\* Read at the Sixteenth Meeting of the British Association for the Advancement of Science.

† The specimens of *Mya truncata* closely resemble the elongated form found close in shore: finding it at so great a depth demands something more than a passing notice, since I am not aware that this variety has ever been found alive elsewhere than in shallow water. Were it certain that the elongated form did not live in deep water, we might then safely conclude that the sea-bottom which was dredged had subsided since the *Myas*, found on it, were living. Since writing the above I find it stated by Professor E.